ATTACHMENT B

Amendments to the Claims

This listing of claims will replace all prior versions, and listings, of claims in the application.

1-4. (canceled)

5. (currently amended) A 4-stroke reciprocating engine operating between a minimum speed of rotation Nmin and a maximum speed Nmax comprising:

a turbocharging unit ~~which~~comprising:

- a compressor which supplies an intake manifold of the engine with compressed air via a cooler;
- a turbine which is supplied with a hot exhaust gas by an exhaust manifold of the engine at an exhaust temperature, the turbine defining an exhaust outlet section Sd offered to said hot exhaust gas; and

an EGR bypass provided between the intake manifold and the exhaust manifold which EGR bypass is dimensioned to transfer a flow of gas between the intake manifold and the outlet manifold without substantial loss of pressure,

such that ~~has~~ a turbine inlet pressure is maintained substantially equal to a compressor discharge pressure,~~;~~

such that~~wherein~~, at constant air temperature and with a ~~fixed geometry~~constant value of the exhaust outlet section Sd, the turbocharging unit delivers a substantially constant volume of cooled air Vc when the compressor discharge pressure varies, ~~wherein~~ the constant volume of cooled air Vc ~~is~~ being substantially proportional to ~~an~~ the exhaust outlet section Sd offered to the hot exhaust gas,

~~wherein the turbine inlet pressure is maintained substantially equal to the compressor discharge pressure by an EGR bypass provided between the intake manifold and the exhaust manifold which EGR bypass is dimensioned to transfer a flow of the hot exhaust gas to the intake manifold without substantial loss of pressure,~~

wherein the exhaust outlet section Sd is selected such that~~the constant volume of cooled air Vc is less than a volume drawn in by the engine at the maximum speed Nmax,~~

~~such that~~ at a turbocharging adaptation speed Na, the volume drawn in by the engine is equal to the constant volume Vc,

~~such that~~ below the turbocharging adaptation speed Na, the volume drawn in by the engine is less than the constant volume of cooled air Vc, and a flow of the cooled air is deflected toward the turbocharging unit through the EGR bypass, and

~~such that~~ above the turbocharging adaptation speed Na and including the maximum speed Nmax, the volume drawn in by the engine is more than the constant volume of cooled air Vc, and a flow of exhaust gas is drawn in by the engine through the EGR bypass,

wherein the EGR bypass has a gas cooler adjustable to ~~cool~~ control the temperature of the transferred flow of the hot exhaust gas ~~down to a temperature close to that of fresh air~~, and

wherein the adjustment of the temperature is effected by controlling a bypass of the cooler.

6. (currently amended) A method of operating a 4-stroke reciprocating engine wherein the engine is operating between a minimum speed of rotation Nmin and a maximum speed Nmax and comprises:

a turbocharging unit comprising~~which~~:

- a compressor which supplies an intake manifold of the engine with compressed air via a cooler;
- a turbine which is supplied with a hot exhaust gas by an exhaust manifold of the engine at an exhaust temperature, the turbine defining an exhaust outlet section Sd offered to said hot exhaust gas; and

an EGR bypass provided between the intake manifold and the exhaust manifold which EGR bypass is dimensioned to transfer a flow of gas between the intake manifold and the outlet manifold without substantial loss of pressure,

such that ~~has~~ a turbine inlet pressure substantially equal to a compressor discharge pressure;

such that~~wherein~~, at constant air temperature and with a ~~fixed geometry~~constant value of the exhaust outlet section Sd, the turbocharging unit delivers a substantially constant volume of cooled air Vc when the compressor discharge pressure varies, ~~wherein~~ the constant

volume of cooled air Vc ~~is~~ being substantially proportional to ~~an~~ the exhaust outlet section Sd offered to the hot exhaust gas,

~~wherein the turbine inlet pressure is maintained substantially equal to the compressor discharge pressure by an EGR bypass provided between the intake manifold and the exhaust manifold which EGR bypass is dimensioned to transfer a flow of the hot exhaust gas to the intake manifold without substantial loss of pressure,~~

wherein the exhaust outlet section Sd is selected such that ~~the constant volume of cooled air Vc is less than a volume drawn in by the engine at the maximum speed Nmax,~~

~~such that~~ at a turbocharging adaptation speed Na, the volume drawn in by the engine is equal to the constant volume Vc,

~~such that~~ below the turbocharging adaptation speed Na, the volume drawn in by the engine is less than the constant volume of cooled air Vc, and a flow of the cooled air is deflected toward the turbocharging unit through the EGR bypass, and

~~such that~~ above the turbocharging adaptation speed Na and including the maximum speed Nmax, the volume drawn in by the engine is more than the constant volume of cooled air Vc, and a flow of exhaust gas is drawn in by the engine through the EGR bypass,

wherein the EGR bypass has a gas cooler adjustable to control ~~cool~~ the temperature of the transferred flow of the hot exhaust gas ~~down to a temperature close to that of fresh air~~, and

wherein the method of operating includes controlling the EGR bypass temperature to create a desired excess of air for combustion in the engine.

7. (currently amended) A method of operating a 4-stroke reciprocating engine wherein the engine is operating between a minimum speed of rotation Nmin and a maximum speed Nmax and comprises:

a turbocharging unit comprising~~which~~:

- a compressor which supplies an intake manifold of the engine with compressed air via a cooler;
- a turbine which is supplied with a hot exhaust gas by an exhaust manifold of the engine at an exhaust temperature, the turbine defining an exhaust outlet section Sd offered to said hot exhaust gas; and

an EGR bypass provided between the intake manifold and the exhaust manifold which EGR bypass is dimensioned to transfer a flow of gas between the intake manifold and the outlet manifold without substantial loss of pressure,

such that ~~has~~ a turbine inlet pressure is maintained substantially equal to a compressor discharge pressure;

such that~~wherein~~, at constant air temperature and with a ~~fixed geometry~~constant value of the exhaust outlet section Sd, the turbocharging unit delivers a substantially constant volume of cooled air Vc when the compressor discharge pressure varies, ~~wherein~~ the constant volume of cooled air Vc ~~is~~ being substantially proportional to ~~an~~ the exhaust outlet section Sd offered to the hot exhaust gas,

~~wherein the turbine inlet pressure is maintained substantially equal to the compressor discharge pressure by an EGR bypass provided between the intake manifold and the exhaust manifold which EGR bypass is dimensioned to transfer a flow of the hot exhaust gas to the intake manifold without substantial loss of pressure,~~

wherein the exhaust outlet section Sd is selected such that~~the constant volume of cooled air Vc is less than a volume drawn in by the engine at the maximum speed Nmax~~,

~~such that~~ at a turbocharging adaptation speed Na, the volume drawn in by the engine is equal to the constant volume Vc,

~~such that~~ below the turbocharging adaptation speed Na, the volume drawn in by the engine is less than the constant volume of cooled air Vc, and a flow of the cooled air is deflected toward the turbocharging unit through the EGR bypass, and

~~such that~~ above the turbocharging adaptation speed Na and including the maximum speed Nmax, the volume drawn in by the engine is more than the constant volume of cooled air Vc, and a flow of exhaust gas is drawn in by the engine through the EGR bypass, and

wherein the EGR bypass has a gas cooler adjustable to control the temperature of ~~cool~~ the transferred flow of the hot exhaust gas ~~down to a temperature close to that of fresh air~~; and

wherein the method of operating includes controlling the EGR bypass temperature so that a mass of the transferred hot exhaust gas remains substantially equal to a mass of the fresh air up to the speed at which this temperature returns to the exhaust temperature, the mass of the transferred hot exhaust gas becoming greater than the mass of the fresh air above this speed.

8. (currently amended) A ~~method of operating a~~ 4-stroke reciprocating engine as claimed in Claim 5, wherein the gas cooler is totally bypassed when the engine does not deliver propulsive power.

9. (currently amended) A ~~method of operating a~~ 4-stroke reciprocating engine as claimed in Claim ~~8~~5, wherein for cold starting and operating at idling speed~~, an adjustment of turbine valves~~ the exhaust outlet section Sd and/or a timing of engine valves is adjusted so that the excess of combustion air is minimal for a desired level of depollution.

10. (canceled)

11. (currently amended) A 4-stroke reciprocating engine as claimed in Claim ~~7~~5,

wherein the adaptation speed Na is substantially equal to Nmin/2 so that the volume of the transferred flow of the hot exhaust gas is at least equal to that of the fresh air, and

wherein the minimum temperature of the transferred flow of the hot exhaust gas is close to the temperature of the fresh air so that a mass of the transferred flow of the hot exhaust gas is at least equal to that of the fresh air at the minimum speed used Nmin in order to depollute down to the minimum speed Nmin.

12. (currently amended) A 4-stroke reciprocating engine operating between a minimum speed of rotation Nmin and a maximum speed Nmax comprising:

a turbocharging unit comprising~~which~~:

- a compressor which supplies an intake manifold of the engine with compressed air via a cooler;
- a turbine which is supplied with a hot exhaust gas by an exhaust manifold of the engine at an exhaust temperature, the turbine defining an exhaust outlet section Sd offered to said hot exhaust gas; and

an EGR bypass provided between the intake manifold and the exhaust manifold which EGR bypass is dimensioned to transfer a flow of gas between the intake manifold and the outlet manifold without substantial loss of pressure,

such that ~~has~~ a turbine inlet pressure is maintained substantially equal to a compressor discharge pressure;

such that~~wherein~~, at constant air temperature and with a ~~fixed geometry~~ constant value of the exhaust outlet section Sd, the turbocharging unit delivers a substantially constant volume of cooled air Vc when the compressor discharge pressure varies, ~~wherein~~ the constant volume of cooled air Vc ~~is~~ being substantially proportional to ~~an~~ the exhaust outlet section Sd offered to the hot exhaust gas,

~~wherein the turbine inlet pressure is maintained substantially equal to the compressor discharge pressure by an EGR bypass provided between the intake manifold and the exhaust manifold which EGR bypass is dimensioned to transfer a flow of the hot exhaust gas to the intake manifold without substantial loss of pressure,~~

wherein the exhaust outlet section Sd is selected such that~~the constant volume of cooled air Vc is less than a volume drawn in by the engine at the maximum speed Nmax~~,

~~such that~~ at a turbocharging adaptation speed Na, the volume drawn in by the engine is equal to the constant volume Vc,

~~such that~~ below the turbocharging adaptation speed Na, the volume drawn in by the engine is less than the constant volume of cooled air Vc, and a flow of the cooled air is deflected toward the turbocharging unit through the EGR bypass, and

~~such that~~ above the turbocharging adaptation speed Na and including the maximum speed Nmax, the volume drawn in by the engine is more than the constant volume of cooled air Vc, and a flow of exhaust gas is drawn in by the engine through the EGR bypass,

wherein the turbocharging unit has a low-pressure LP turbocharger having an LP turbine and an LP compressor, and a high-pressure HP turbocharger having an HP turbine and an HP compressor, the LP and HP compressors ~~of which~~ working in series,

wherein ~~with an~~ the exhaust outlet section Sd ~~which~~ offered to the hot exhaust gases is adjustable between a minimum Sd min and a maximum Sd max by one or a combination of the following:

- adjustment of a variable section of a gas distributor of the ~~turbochargers~~ turbines,
- opening of a bypass between an inlet and an outlet of the turbines~~turbochargers~~, and
- passage from a series configuration to a parallel configuration of the turbines~~turbochargers~~,

the turbocharging adaptation speed Na thus being adjustable, in a continuous or discontinuous manner, between two values Na min and Na max.

13. (currently amended) A 4-stroke reciprocating engine as claimed in Claim 12, wherein the minimum exhaust outlet section Sd min offered to the gases is formed by the two ~~turbochargers~~ turbines mounted in series, with variable distributors being at maximum closure.

14. (currently amended) A 4-stroke reciprocating engine as claimed in Claim ~~13~~12, ~~which operates on a 4-stroke cycle with a fixed timing of associated valves~~ wherein the minimum exhaust outlet section Sd min offered to the hot exhaust gas is formed by the two turbines with fixed distributors mounted in series, waste gates of the turbines being in a closed position.

15. (currently amended) A 4-stroke reciprocating engine as claimed in Claim 12,

wherein the maximum exhaust outlet section Sd max offered to the gases is formed by the two ~~turbochargers~~ turbines which have fixed distributors mounted in parallel, and

wherein, in order to pass the turbines ~~turbochargers~~ from the series configuration to the parallel configuration, the following manoeuvres are carried out successively:

- progressive partial opening of an HP waste gate between the inlet and the outlet of the HP turbine~~turbocharger~~,
- progressive and simultaneous partial opening of the HP waste gate and an LP waste gate~~,~~ between the inlet and the outlet of the LP turbine~~turbocharger~~, and
- simultaneously and rapidly: total opening of the HP waste gate, total closure of the LP waste gate, and putting the outlet of the HP turbine ~~turbocharger~~ into communication with the outlet of the LP turbine~~turbocharger~~.

16. (currently amended) A 4-stroke reciprocating engine as claimed in Claim ~~14~~12,

wherein the maximum outlet section Sd max offered to the gases is formed by the LP turbine ~~turbocharger~~ with fixed distributor and the HP turbine ~~turbochargers~~ with variable distributor mounted in parallel, ~~the~~ an HP variable distributor being fully open, and

wherein, in order to pass the turbines ~~turbochargers~~ from the series configuration to the parallel configuration, the following manoeuvres are carried out successively:

progressive opening of a distributor of the HP turbine~~turbocharger~~,

progressive partial opening of an LP waste gate,

simultaneously and rapidly: total opening of the LP waste gate and putting the outlet of the HP turbine ~~turbocharger~~ into communication with the outlet of the LP turbine~~turbocharger~~.

17. (currently amended) A ~~method of operating a~~ 4-stroke reciprocating engine as claimed in claim 12, ~~wherein the engine is operating between a minimum speed of rotation Nmin and a maximum speed Nmax and comprises:~~

~~a turbocharging unit which:~~

- ~~supplies an intake manifold of the engine with compressed air via a cooler;~~
- ~~is supplied with a hot exhaust gas by an exhaust manifold of the engine at an exhaust temperature; and~~
- ~~has a turbine inlet pressure substantially equal to a compressor discharge pressure;~~

~~wherein, at constant air temperature and with a fixed geometry, the turbocharging unit delivers a substantially constant volume of cooled air Vc when the compressor discharge pressure varies,~~

~~wherein the constant volume of cooled air Vc is substantially proportional to an exhaust outlet section Sd offered to the hot exhaust gas,~~

~~wherein the turbine inlet pressure is maintained substantially equal to the compressor discharge pressure by an EGR bypass provided between the intake manifold and the exhaust manifold which EGR bypass is dimensioned to transfer a flow of the hot exhaust gas to the intake manifold without substantial loss of pressure,~~

~~wherein the constant volume of cooled air Vc is less than a volume drawn in by the engine at the maximum speed Nmax,~~

~~such that at a turbocharging adaptation speed Na, the volume drawn in by the engine is equal to the constant volume Vc,~~

~~such that below the turbocharging adaptation speed Na, the volume drawn in by the engine is less than the constant volume of cooled air Vc, and a flow of the cooled air is deflected toward the turbocharging unit through the EGR bypass, and~~

~~such that above the turbocharging adaptation speed Na, the volume drawn in by the engine is more than the constant volume of cooled air Vc, and a flow of exhaust gas is drawn in by the engine through the EGR bypass, and~~

wherein the EGR bypass has an EGR valve to increase the turbine inlet pressure above the compressor discharge pressure; and

wherein the method of operating includes, in order to limit a frequency of changing a configuration, ~~immobilizing of the fixed geometry~~maintaining the turbines in series configuration for a type of driving which implements a limited power range, and crossing power thresholds corresponding to ~~each~~ this configuration ~~are crossed~~ for manoeuvres of short duration~~, and wherein the method of operating further includes crossing of the power thresholds~~ by closure of the EGR valve.

18. (currently amended) A ~~method of operating a~~ 4-stroke reciprocating engine as claimed in claim 15, ~~wherein the engine is operating between a minimum speed of rotation Nmin and a maximum speed Nmax and comprises:~~

~~a turbocharging unit which:~~

- ~~supplies an intake manifold of the engine with compressed air via a cooler;~~
- ~~is supplied with a hot exhaust gas by an exhaust manifold of the engine at an exhaust temperature; and~~
- ~~has a turbine inlet pressure substantially equal to a compressor discharge pressure;~~

~~wherein, at constant air temperature and with a fixed geometry, the turbocharging unit delivers a substantially constant volume of cooled air Vc when the compressor discharge pressure varies,~~

~~wherein the constant volume of cooled air Vc is substantially proportional to an exhaust outlet section Sd offered to the hot exhaust gas,~~

~~wherein the turbine inlet pressure is maintained substantially equal to the compressor discharge pressure by an EGR bypass provided between the intake manifold and the exhaust manifold which EGR bypass is dimensioned to transfer a flow of the hot exhaust gas to the intake manifold without substantial loss of pressure,~~

~~wherein the constant volume of cooled air Vc is less than a volume drawn in by the engine at the maximum speed Nmax,~~

~~such that at a turbocharging adaptation speed Na, the volume drawn in by the engine is equal to the constant volume Vc,~~

~~such that below the turbocharging adaptation speed Na, the volume drawn in by the engine is less than the constant volume of cooled air Vc, and a flow of the cooled air is deflected toward the turbocharging unit through the EGR bypass, and~~

~~such that above the turbocharging adaptation speed Na, the volume drawn in by the engine is more than the constant volume of cooled air Vc, and a flow of exhaust gas is drawn in by the engine through the EGR bypass, and~~

~~wherein the turbocharging unit comprises one or two waste gates, each an inlet and an outlet of a turbocharger; and~~

wherein ~~the method of operating includes~~, in order to limit a frequency of changing a configuration, the turbines are maintained in a series configuration ~~immobilizing of the fixed geometry~~ for a type of driving which implements a limited power range, and crossing power thresholds corresponding to ~~each~~ this configuration ~~are crossed~~ for manoeuvres of short duration~~, and wherein the method of operating further includes crossing of the thresholds~~ by opening of one or ~~two~~both of the waste gates.

19. (currently amended) A method of operating a 4-stroke reciprocating engine as claimed in Claim 18,

wherein, the EGR bypass has an EGR valve to increase the turbine inlet pressure above the compressor discharge pressure, and

the method includes crossing of the power thresholds by closure of the EGR valve~~,~~ and by opening of one or ~~two~~ both of the waste gates.

20. (currently amended) A 4-stroke reciprocating engine as claimed in Claim 15, wherein the LP waste gate has a second seat in order simultaneously to effect a closure of the LP ~~turbocharger~~ turbine inlet/outlet bypass and putting the HP turbine ~~turbocharger~~ outlet into communication with the LP turbine outlet.

21. (currently amended) A 4-stroke reciprocating engine as claimed in Claim 15, wherein the two waste gates are concentric and have stops such that simultaneous movements thereof are actuated by one and communicated to the other by the stops.

22. (currently amended) A 4-stroke reciprocating engine as claimed in Claim 13 wherein the maximum exhaust outlet section Sd max is formed by two turbines with fully open variable distributors mounted in series, and wherein the distributors are opened simultaneously in order to maintain the intake pressure at a maximum desired value thereof on a full load curve.

23. (currently amended) A 4-stroke reciprocating engine as claimed in Claim ~~13~~14,

wherein a timing of engine valves is controlled to displace a closure of an associated cylinder between the vicinity of the BDC and the mid-stroke of an associated piston,

wherein the maximum exhaust outlet section Sd is formed by the HP turbine ~~turbocharger~~ in series configuration; and

wherein the turbines ~~turbochargers~~ are dimensioned to permit the compressors thereof to reach maximum pressure ratios thereof simultaneously.

24. (currently amended) A method of operating a 4-stroke reciprocating engine as claimed in Claim 23, wherein a full load curve as a function of the speed is operated as follows:

from Nmin to 2 Nmin, an intake closure FA passes from the BDC to approximately 90 degrees of a crankshaft after the BDC to maintain a cycle pressure below a desired value thereof, and

a distributor or an HP waste gate is closed;

from 2 Nmin to approximately 3 Nmin, the HP distributor or the HP waste gate is open to maintain an intake pressure at a maximum desired value thereof, and

the intake closure FA is maintained at 90 degrees of the crankshaft after the BDC; and

from 3 Nmin to Nmax, a global flow rate of fuel is kept constant to maintain the intake pressure at a limiting value thereof, and

at partial load, a timing of intake closure FA is controlled according to a map stored in an engine control computer.

25. - 28. (canceled)

29. (currently amended) A method of operating a 4-stroke reciprocating engine as claimed in Claim 6, wherein the exhaust outlet section Sd is selectively variable and is controlled:

at full load, ~~the fixed geometry is selectively variable and is controlled~~ to maintain a parameter at a limiting desired value thereof; and

at partial load, ~~the variable geometry is controlled~~ to optimize depollution and/or performance according to a map stored in an engine control computer.

30. (currently amended) A method of operating a 4-stroke reciprocating engine as claimed in Claim 7, wherein the exhaust outlet section Sd is selectively variable and is controlled:

at full load, ~~the fixed geometry is selectively variable and is controlled~~ to maintain a parameter at a limiting desired value thereof; and

at partial load, ~~the variable geometry is controlled~~ to optimize depollution and/or performance according to a map stored in an engine control computer.

31. (currently amended) A method of operating a 4-stroke reciprocating engine as claimed in Claim 8, wherein the exhaust outlet section Sd is selectively variable and is controlled:

at full load, ~~the fixed geometry is selectively variable and is controlled~~ to maintain a parameter at a limiting desired value thereof; and

at partial load, ~~the variable geometry is controlled~~ to optimize depollution and/or performance according to a map stored in an engine control computer.

32. (currently amended) A method of operating a 4-stroke reciprocating engine as claimed in Claim 9, wherein the exhaust outlet section Sd is selectively variable and is controlled:

at full load, ~~the fixed geometry is selectively variable and is controlled~~ to maintain a parameter at a limiting desired value thereof; and

at partial load, ~~the variable geometry is controlled~~ to optimize depollution and/or performance according to a map stored in an engine control computer.

33. (currently amended) A method of operating a 4-stroke reciprocating engine as claimed in Claim 17, wherein the exhaust outlet section Sd is selectively variable and is controlled:

at full load, ~~the fixed geometry is selectively variable and is controlled~~ to maintain a parameter at a limiting desired value thereof; and

at partial load, ~~the variable geometry is controlled~~ to optimize depollution and/or performance according to a map stored in an engine control computer.

34. (currently amended) A method of operating a 4-stroke reciprocating engine as claimed in Claim 18, wherein the exhaust outlet section Sd is selectively variable and is controlled:

at full load, ~~the fixed geometry is selectively variable and is controlled~~ to maintain a parameter at a limiting desired value thereof; and

at partial load, ~~the variable geometry is controlled so as~~ to optimize depollution and/or performance according to a map stored in an engine control computer.

35. (currently amended) A method of operating a 4-stroke reciprocating engine as claimed in Claim 19, wherein the exhaust outlet section Sd is selectively variable and is controlled:

at full load, ~~the fixed geometry is selectively variable and is controlled~~ to maintain a parameter at a limiting desired value thereof; and

at partial load, ~~the variable geometry is controlled~~ to optimize depollution and/or performance according to a map stored in an engine control computer.

36. (currently amended) A method of operating a 4-stroke reciprocating engine as claimed in Claim 24, wherein the exhaust outlet section Sd is selectively variable and is controlled:

at full load, ~~the fixed geometry is selectively variable and is controlled~~ to maintain a parameter at a limiting desired value thereof; and

at partial load, ~~the variable geometry is controlled~~ to optimize depollution and/or performance according to a map stored in an engine control computer.

37. - 38. (canceled)

39. (currently amended) A 4-stroke reciprocating engine operating between a minimum speed of rotation Nmin and a maximum speed Nmax comprising:

a turbocharging unit comprising~~which~~:

- a compressor which supplies an intake manifold of the engine with compressed air via a cooler;
- a turbine which is supplied with a hot exhaust gas by an exhaust manifold of the engine at an exhaust temperature, the turbine defining an exhaust outlet section Sd offered to said hot exhaust gas; and

an EGR bypass provided between the intake manifold and the exhaust manifold which EGR bypass is dimensioned to transfer a flow of gas between the intake manifold and the outlet manifold without substantial loss of pressure,

such that ~~has~~ a turbine inlet pressure is maintained substantially equal to a compressor discharge pressure;

such that~~wherein~~, at constant air temperature and with a constant value of the exhaust outlet section Sd~~fixed geometry~~, the turbocharging unit delivers a substantially constant volume of cooled air Vc when the compressor discharge pressure varies, ~~wherein~~ the constant volume of cooled air Vc ~~is~~ being substantially proportional to an exhaust outlet section Sd offered to the hot exhaust gas,

~~wherein the turbine inlet pressure is maintained substantially equal to the compressor discharge pressure by an EGR bypass provided between the intake manifold and the exhaust manifold which EGR bypass is dimensioned to transfer a flow of the hot exhaust gas to the intake manifold without substantial loss of pressure,~~

wherein the exhaust outlet section Sd is selected such that~~the constant volume of cooled air Vc is less than a volume drawn in by the engine at the maximum speed Nmax~~,

~~such that~~ at a turbocharging adaptation speed Na, the volume drawn in by the engine is equal to the constant volume Vc,

~~such that~~ below the turbocharging adaptation speed Na, the volume drawn in by the engine is less than the constant volume of cooled air Vc, and a flow of the cooled air is deflected toward the turbocharging unit through the EGR bypass, and

~~such that~~ above the turbocharging adaptation speed Na and including the maximum speed Nmax, the volume drawn in by the engine is more than the constant volume of cooled air Vc, and a flow of exhaust gas is drawn in by the engine through the EGR bypass; and

further including a flat cylinder head having intake pipes and bearing intake valves having faces on a chamber side which are coplanar with the cylinder head and substantially tangent to a cylinder,

wherein ~~an~~ each intake pipe ~~or pipes~~ terminates~~(s)~~ at an oblong nozzle defined by an upper half-cylinder resting on an upper edge of a conical seat and tangent to said seat along a generating line thereof situated in a plane substantially perpendicular to a plane passing through an axis of the conical seat and through an axis of the cylinder and ~~through~~ by a lower cylinder covering a half of a valve head of the intake valve opposite the generating line,

wherein the nozzles are ~~also~~ oriented to create a tangential ~~speed~~ flow in a same direction in the cylinder ~~, and wherein angles of the seats are chosen to optimize stratification~~ of a combustive charge passed into the cylinder by said nozzles when said nozzles are in an opened position.

40. (currently amended) A 4-stroke reciprocating engine operating between a minimum speed of rotation Nmin and a maximum speed Nmax comprising:

a turbocharging unit comprising~~which~~:

- a compressor which supplies an intake manifold of the engine with compressed air via a cooler;

- a turbine which is supplied with a hot exhaust gas by an exhaust manifold of the engine at an exhaust temperature, the turbine defining an exhaust outlet section Sd offered to said hot exhaust gas; and

an EGR bypass provided between the intake manifold and the exhaust manifold which EGR bypass is dimensioned to transfer a flow of gas between the intake manifold and the outlet manifold without substantial loss of pressure,

such that ~~has~~ a turbine inlet pressure is maintained substantially equal to a compressor discharge pressure, ~~;~~ and

such that~~wherein~~, at constant air temperature and with a constant value of the exhaust outlet section Sd~~fixed geometry~~, the turbocharging unit delivers a substantially constant volume of cooled air Vc when the compressor discharge pressure varies, ~~wherein~~ the constant volume of cooled air Vc ~~is~~ being substantially proportional to an exhaust outlet section Sd offered to the hot exhaust gas,

~~wherein the turbine inlet pressure is maintained substantially equal to the compressor discharge pressure by an EGR bypass provided between the intake manifold and the exhaust manifold which EGR bypass is dimensioned to transfer a flow of the hot exhaust gas to the intake manifold without substantial loss of pressure,~~

wherein the exhaust outlet section Sd is selected such that~~the constant volume of cooled air Vc is less than a volume drawn in by the engine at the maximum speed Nmax~~,

~~such that~~ at a turbocharging adaptation speed Na, the volume drawn in by the engine is equal to the constant volume Vc,

~~such that~~ below the turbocharging adaptation speed Na, the volume drawn in by the engine is less than the constant volume of cooled air Vc, and a flow of the cooled air is deflected toward the turbocharging unit through the EGR bypass, and

~~such that~~ above the turbocharging adaptation speed Na and including the maximum speed Nmax, the volume drawn in by the engine is more than the constant volume of cooled air Vc, and a flow of exhaust gas is drawn in by the engine through the EGR bypass;

further including a flat cylinder head having intake pipes and bearing intake valves having faces on a chamber side which are coplanar with the cylinder head and substantially tangent to a cylinder,

wherein a conical sealing bearing surface of each intake valve~~s~~ is extended towards a piston by a cylindrical part ~~having a height slightly greater than a lift of the valves~~,

wherein the conical seat~~ling~~ ~~bearing surfaces~~ of ~~the~~ each intake valve~~s~~ is~~are~~ disposed at a bottom of a cylindrical recess~~es~~ provided in ~~a~~ the cylinder head in order to receive the cylindrical part~~s~~ of the intake valve~~s~~ such that a flat lower face~~s~~ of the valve~~s~~ ~~are~~ is in a plane of the cylinder head when the valve ~~lower faces~~ rests on the associated seat~~s~~ thereof, a clearance between the recess~~es~~ and the ~~valves~~ cylindrical part being minimal, and

wherein ~~the~~ each recess~~es~~ ~~are~~ is provided in the cylinder head and does not go beyond the following boundaries:

- two cylindrical portions coaxial with the cylinder ~~concentric with a bore~~ and tangent externally and internally to the cylindrical recess of each valve, and
- a conical surface extending a half-seat of the valve delimited by a plane passing through an axis thereof and an axis of the cylinder;

wherein the recesses are ~~also~~ oriented to create a tangential ~~velocity~~ flow in a same direction in the cylinder~~, and wherein an angle of the seats is chosen to optimize a stratification~~ of a combustive charge passed into the cylinder by said nozzles when said nozzles are in an opened position.

41. (currently amended) A 4-stroke reciprocating engine as Claimed in Claim 39, including two diametrically opposed intake valves.

42. (currently amended) A 4-stroke reciprocating engine as Claimed in Claim 40, including two diametrically opposed intake valves.

43. - 51. (canceled)

52. (currently amended) A 4-stroke reciprocating engine as in claim 15, wherein the section of the HP waste gate fully opened is smaller than the section of the LP ~~turbocharger~~ turbine to increase the gas flow through the HP turbine ~~turbocharger~~ in the parallel configuration.

53. (currently amended) A reciprocating engine including a flat cylinder head having intake pipes and bearing intake valves having faces on a chamber side which are coplanar with the cylinder head and substantially tangent to a cylinder,

wherein ~~an~~ each intake pipe ~~or pipes~~ terminates~~(s)~~ at an oblong nozzle defined by an upper half-cylinder resting on an upper edge of a conical seat and tangent to said seat along a generating line thereof situated in a plane substantially perpendicular to a plane passing through an axis of the conical seat and through an axis of the cylinder and ~~through~~ by a lower cylinder covering a half of a valve head of the intake valve opposite the generating line,

wherein the nozzles are ~~also~~ oriented to create a tangential ~~speed~~ flow in a same direction in the cylinder~~, and wherein angles of the seats are chosen to optimize stratification~~ of a combustive charge passed into the cylinder by said nozzles when said nozzles are in an opened position.

54. (currently amended) A reciprocating engine including a flat cylinder head having intake pipes and bearing intake valves having faces on a chamber side which are coplanar with the cylinder head and substantially tangent to a cylinder,

wherein a conical sealing bearing surface of each intake valves is extended towards a piston by a cylindrical part ~~having a height slightly greater than a lift of the valves~~,

wherein the conical seat~~ling~~ ~~bearing surfaces~~ of each intake ~~the~~ valves ~~are~~ is disposed at a bottom of a cylindrical recesses provided in ~~a~~ the cylinder head in order to receive the cylindrical parts of the intake valves such that flat lower faces of the valves ~~are~~ is in a plane of the cylinder head when the ~~lower faces~~valve rests on the associated seats thereof, a clearance between the recesses and the ~~valves~~ cylindrical part being minimal, and

wherein ~~the~~ each recesses ~~are~~ is provided in the cylinder head and does not go beyond the following boundaries:

- two cylindrical portions coaxial with the cylinder ~~concentric with a bore~~ and tangent externally and internally to the cylindrical recess of each valve, and
- a conical surface extending a half-seat of the valve delimited by a plane passing through an axis thereof and an axis of the cylinder;

wherein the recesses are ~~also~~ oriented to create a tangential ~~velocity~~ flow in a same direction in the cylinder~~, and wherein an angle of the seats is chosen to optimize a stratification~~ of a

combustive charge passed into the cylinder by said nozzles when said nozzles are in an opened position.

55. (canceled)

56. (new) A reciprocating engine as claimed in claim 40, wherein the cylindrical part of each intake valve has a height slightly greater than a lift of said valve.

57. (new) A reciprocating engine as claimed in claim 54, wherein the cylindrical part of each intake valve has a height slightly greater than a lift of said valve.

58. (new) A reciprocating engine including a cylinder, a cylinder head having intake pipes, and intake valves to selectively open or close an end of each intake pipe, wherein the cylinder head is adapted to accommodate the valve head of each valve such that at least at the beginning of the opening of each valve a flow opening is created between the valve head and the end of the pipe only in an angular sector about the axis of the valve, the angular sector of the intake valve being oriented relative to the cylinder to impart a tangential flow to an incoming gas about the axis of the cylinder.

59. (new) A reciprocating engine as claimed in claim 39, wherein an angle of the seats is chosen to be between 90-120° to optimize a stratification of the combustive charge.

60. (new) A reciprocating engine as claimed in claim 40, wherein an angle of the seats is chosen to be between 90-120° to optimize a stratification of the combustive charge.

61. (new) A reciprocating engine as claimed in claim 53, wherein an angle of the seats is chosen to be between 90-120° to optimize a stratification of the combustive charge.

62. (new) A reciprocating engine as claimed in claim 54, wherein an angle of the seats is chosen to be between 90-120° to optimize a stratification of the combustive charge.